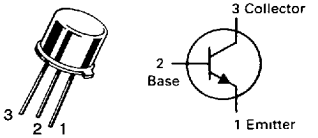
Boca Semiconductor Corp. (BSC)

2N3500
2N3501★

CASE 79-04, STYLE 1
TO-39 (TO-205AD)



GENERAL PURPOSE TRANSISTORS

NPN SILICON

★2N3501 is a Motorola designated preferred device.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	150	Vdc
Collector-Base Voltage	V_{CBO}	150	Vdc
Emitter-Base Voltage	V_{EBO}	6.0	Vdc
Collector Current — Continuous	I_C	300	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	1.0 5.71	Watt mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	5.0 28.6	Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	175	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	35	°C/W

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector-Emitter Breakdown Voltage (1) (I_C = 10 mAdc, I_B = 0)	2N3500, 2N3501	$V_{(BR)CEO}$	150	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	2N3500, 2N3501	$V_{(BR)CBO}$	150	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)		$V_{(BR)EBO}$	6.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 75 Vdc, I_E = 0) (V_{CB} = 75 Vdc, I_E = 0, T_A = 150°C)	2N3500, 2N3501	I_{CBO}	— —	— —	0.05 50	μAdc
Emitter Cutoff Current ($V_{EB(off)}$ = 4 0 Vdc, I_C = 0)		I_{EBO}	—	—	25	nAdc
ON CHARACTERISTICS						
DC Current Gain (I_C = 0.1 mAdc, V_{CE} = 10 Vdc) (I_C = 1.0 mAdc, V_{CE} = 10 Vdc) (I_C = 10 mAdc, V_{CE} = 10 Vdc) (1) (I_C = 150 mAdc, V_{CE} = 10 Vdc) (1) (I_C = 300 mAdc, V_{CE} = 10 Vdc) (1)	 2N3500 2N3501 2N3500 2N3501 2N3500 2N3501 2N3500 2N3501 2N3500 2N3501	h_{FE}	 20 35 25 50 35 75 40 100 15 20	 — — — — — — — — — —	 — — — — — — 120 300 — —	—
Collector-Emitter Saturation Voltage (1) (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 50 mAdc, I_B = 5 0 mAdc) (I_C = 150 mAdc, I_B = 15 mAdc)	 All Types All Types 2N3500, 2N3501	$V_{CE(sat)}$	 — — —	 — — —	 0.2 0 25 0.4	Vdc

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ELECTRICAL CHARACTERISTICS (continued) (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Typ	Max	Unit
Base-Emitter Saturation Voltage (1)		$V_{BE(sat)}$				Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)	All Types		—	—	0.8	
(I_C = 50 mAdc, I_B = 5.0 mAdc)	All Types		—	—	0.9	
(I_C = 150 mAdc, I_B = 15 mAdc)	2N3500, 2N3501		—	—	1.2	
SMALL-SIGNAL CHARACTERISTICS						
Current-Gain — Bandwidth Product (2) (V_{CE} = 20 Vdc, I_C = 20 mAdc, f = 100 MHz)		f_T	150	—	—	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)	2N3500, 2N3501	c_{obo}	—	—	8.0	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)		C_{ibo}	—	—	80	pF
Input Impedance	2N3500	h_{ie}	0.2	—	1.0	k ohms
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N3501		0.25	—	1.25	
Voltage Feedback Ratio	2N3500	h_{re}	—	—	2.5	X 10^{-4}
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N3501		—	—	4.0	
Small-Signal Current Gain	2N3500	h_{fe}	50	—	300	—
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N3501		75	—	375	
Output Admittance	2N3500	h_{oe}	—	—	100	μmhos
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N3501		—	—	200	
SWITCHING CHARACTERISTICS						
Delay Time (I_C = 150 mAdc, I_{B1} = 15 mAdc, V_{CC} = 100 Vdc, $V_{BE(off)}$ = −2.0 Vdc)		t_d	—	20	—	ns
Rise Time (I_C = 150 mAdc, I_{B1} = 15 mAdc, V_{CC} = 100 Vdc, $V_{BE(off)}$ = −2.0 Vdc)		t_r	—	35	—	ns
Storage Time (I_C = 150 mAdc, I_{B1} = I_{B2} = 15 mAdc, V_{CC} = 100 Vdc)		t_s	—	800	—	ns
Fall Time (I_C = 150 mAdc, I_{B1} = I_{B2} = 15 mAdc, V_{CC} = 100 Vdc)		t_f	—	80	—	ns

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

(2) $f_T = |h_{fe}| \cdot f_{test}$.

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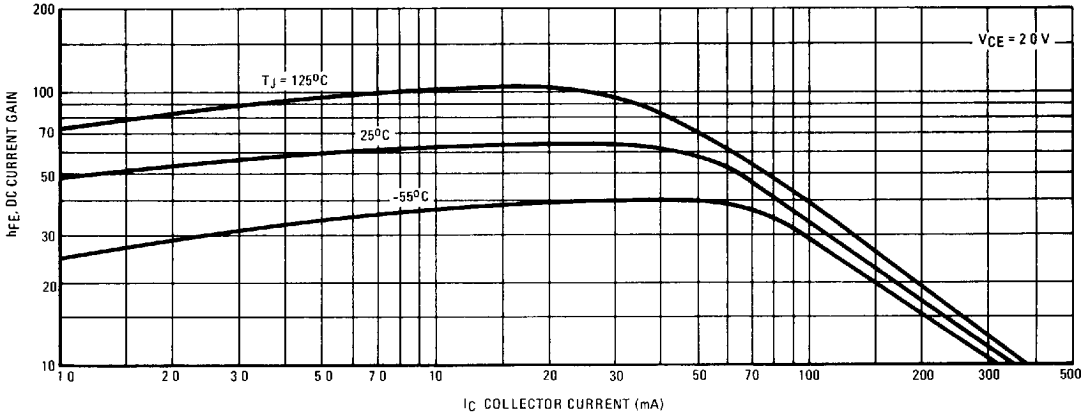
FIGURE 1 — CURRENT GAIN CHARACTERISTICS versus JUNCTION TEMPERATURE

2N3500



2N3501

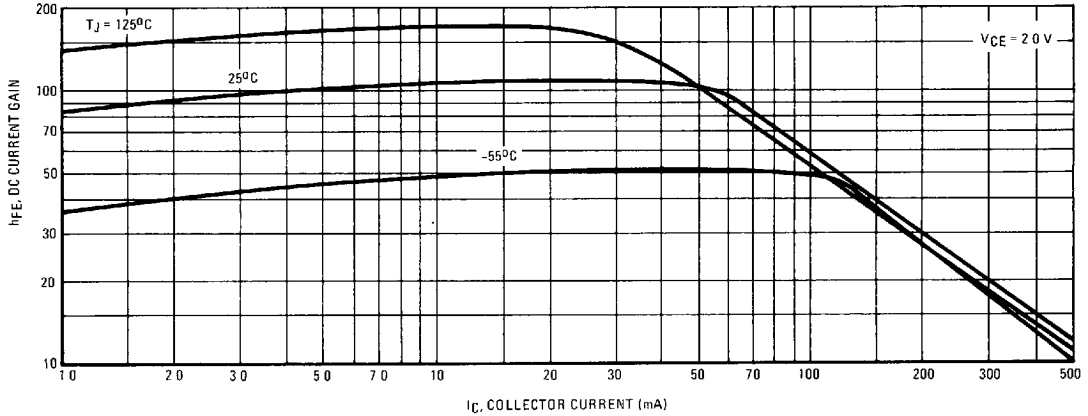


FIGURE 2 — CURRENT GAIN CHARACTERISTICS versus COLLECTOR-EMITTER VOLTAGE

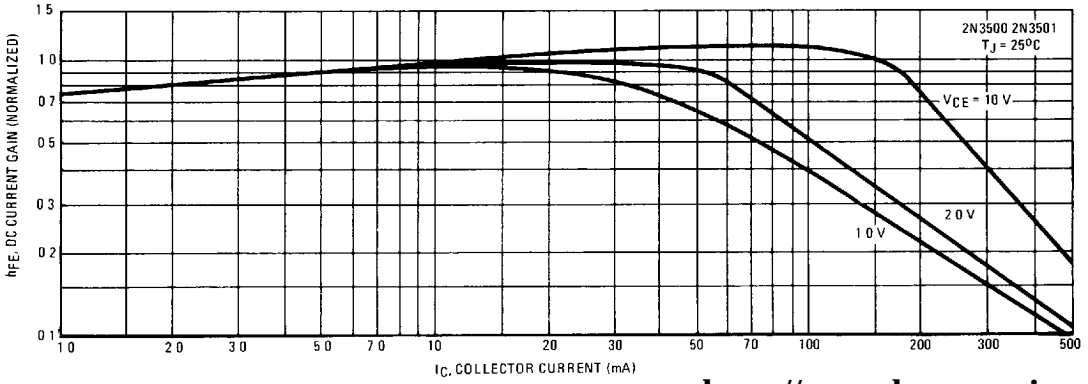


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FIGURE 3 — "ON" VOLTAGES

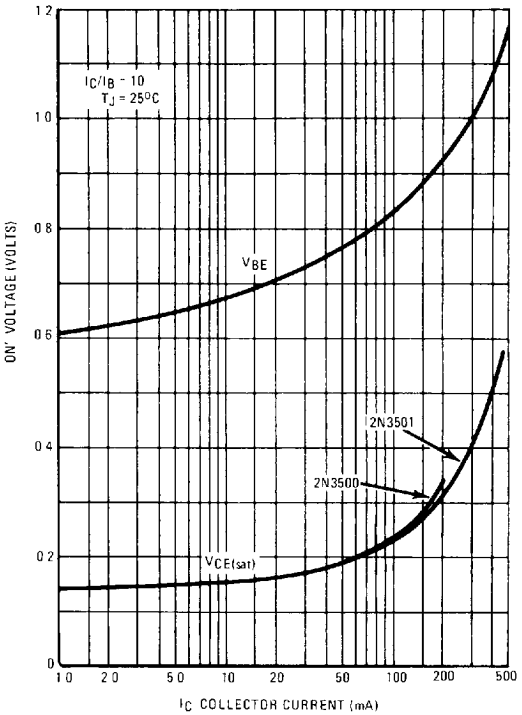


FIGURE 4 — TEMPERATURE COEFFICIENTS

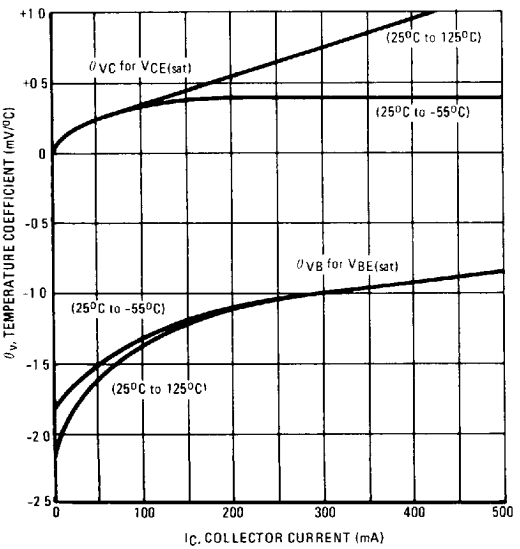
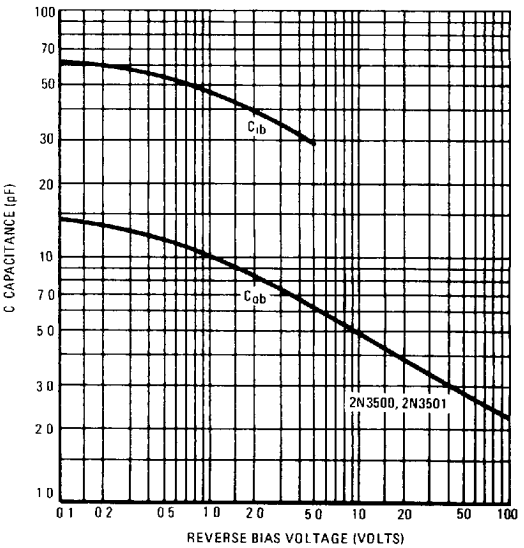


FIGURE 5 — CAPACITANCE



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AUDIO SMALL-SIGNAL h PARAMETER CHARACTERISTICS

(V_{CE} = 10 Vdc, T_A = 25°C, f = 1.0 kHz)

FIGURE 6 — CURRENT GAIN

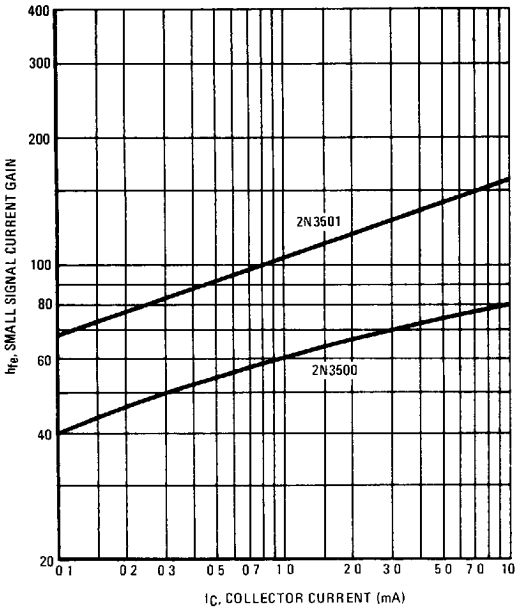

FIGURE 7 — OUTPUT IMPEDANCE

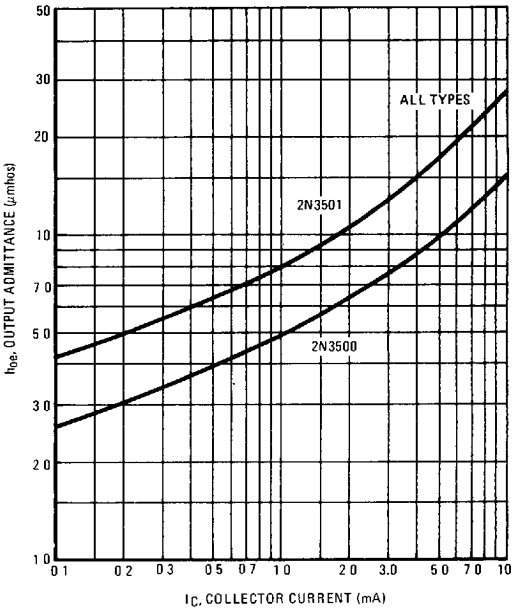

FIGURE 8 — INPUT IMPEDANCE

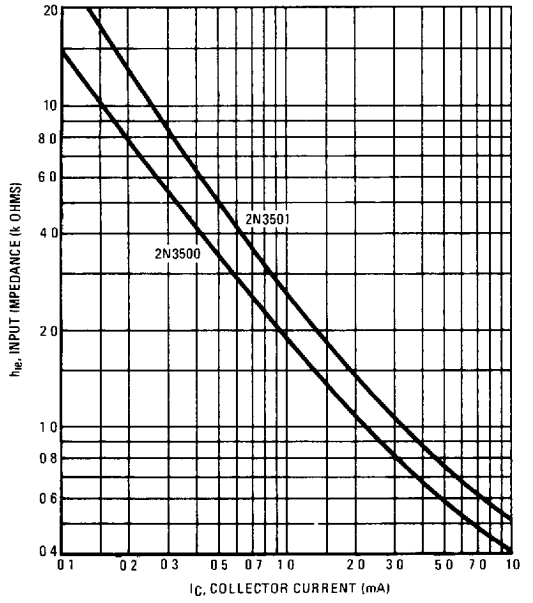

FIGURE 9 — VOLTAGE FEEDBACK RATIO